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NEW SPECIES OF OPUNTIA.

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This 6th installment* of critical studies in the genus *Opuntia* contains descriptions of new species studied in their natural habitat and under cultivation. The types, now in most cases at field stations in Texas and California, will in the future be deposited in the United States Department of Agriculture.

***Opuntia magna* sp. nov.**

A tall open branched, large shrub, or small tree, 2 or 3 m. or more high, and quite symmetrically arborescent, having a distinct cylindrical axis which is undivided, and branching perfectly or imperfectly whorled at the apex of previous season's growth, the trunks 10 cm. or more in diameter, strongly tubercular for 5 or 6 years, after that more or less smooth and dirty gray-brown; joints cylindrical, 30 cm. or more long and 4 cm. in diameter, very strongly tubercular, the tubercles being 15 mm. high and 4 to 4½ cm. long, upper and lower curvatures uniform, the whole surrounded by a depressed darkened line separating contiguous tubercles; areoles situated on upper slope of tubercles, white, lenticular, prominently glandular, turning dirty-gray-black in age, 8 mm. long, becoming obovate by formation of new white, glandular areolar tissue above; leaves 2 to 3 cm. long, terete, subulate, cuspidate, backward curved, tinged with red at tip, 2½ mm. in diameter at base; spicules yellow in a small scarcely protruding tuft in upper angle of areole, not visible in age; spines reddish-brown with prominent rather gray sheathes on current season's growth, 9 to 15, the lower sloping down and 15 mm. long, the 2 lateral just above also sloping down and 10 to 12 mm. long, the others shorter and more erect, spreading, not increasing much in length in age, but increasing in numbers to 30 or 40 on old trunks; flowers purple; fruit strictly annual, strongly tubercular, subglobose to hemispherical, deeply cupped at apex, 30 to 35 mm. in diameter, bearing white areoles without visible glands, bearing a triangular tuft of yellow

* Annual Reports Mo. Bot. Gard. 19-22: 1908-1912, and M. f. K. 23: 1913.

spicules, 1 mm. long and 1 to 3 long, delicate reddish-brown fugacious spines, 1 to 2 mm. in length and sheathed at their tips only, and 2 to 3 delicate, fugacious, shorter, lighter colored unsheathed bristles beside; seeds white, typical of the group, and 3 mm. in diameter.

This species belongs to the *Op. arborescens* group. The type is preserved under my inventory No. 8152, which was grown from cuttings secured near Torreon, Mexico, September 24, 1905.

***Opuntia spinotecta* sp. nov.**

An arborescent, divaricately branched, cylindrical jointed species, 2½ m. high, with trunks 10 to 12 cm. in diameter, commonly compactly, but in age openly branched, and having thick fusiform, tuberous roots; joints variable, but mostly 10 to 15 cm. long, but often 40 cm. in length, somewhat clavate, the tubercles 1 cm. high, with upper crest half the length of the lower and a darker green line surrounding the entire tubercle; areoles occupying upper crest of tubercles, broadly obovate, 3 to 4 mm. long, tawny, turning to dirty gray or black, but with new tawny wool appearing in upper part of areole for two years or more; leaves cylindrical, subulate, cuspidate, 1 cm. long; spicules white, not conspicuous on either joint or fruit; spines 3 to 6, mostly 4, the upper central the longest, about 3 cm. long and loosely sheathed, the lower lateral ones losing their sheathes early, flesh-colored or brown, with white papery sheathes; flowers purple; fruit obovate to subglobose, yellowish-green, persistent.

The type bears my inventory No. 9859, collected at Durango, Mexico, September, 1909. The description was drawn mainly in the type locality. The plant has been in cultivation since the date of collection.

***Opuntia valida* sp. nov.**

An erect to ascending, widely radiating branched species, with main limbs ascending or horizontal, and sometimes resting on edge under cultivation, but mostly erect to ascending in natural habitat, 1 m. in height and 2 m. in spread of branch; joints obovate, large, thick, glaucous, slightly blue-green, very broadly pointed or rounded above, commonly 25 by 32 cm. or again 25 by 27 cm., 1 joint on plants in cultivation, 30 by 42 cm. which is unusual; areoles very large, ovate, 8 mm. long on sides of joints and on edges subcircular, 9 to 11 mm. in diameter, at first brown, turning almost black, finally gray, the wool prominent, mostly elevated 1 or 2 mm. above surface of joint especially on the edges, spicules scattered, not numerous, from 2 mm. long on sides to 1 cm. long on edges of joints, commonly only about 25, increasing in age, but always scattered through entire areole, although at first appearing on its upper half, stout and faintly annular; spines bright deep reddish-brown at base, fading gradually to a semi-translucent bone-like tip, and in age becoming gray, flattened on upper side, faintly annular, sometimes slightly twisted, diverging in all directions, 2 to 5 strongly

diverging centrals, 2 to 6 cm. long and 2 to 5 weaker, very much shorter, recurved ones below; flowers yellow; fruit reddish-purple.

The type is preserved under my collection No. 9194, prepared from cultivated specimens at San Antonio, Texas, which were grown from cuttings secured in the vicinity of San Antonio, New Mexico, in 1908.

***Opuntia brachyclada* sp. nov.**

A low, caespitose species, seldom attaining a height of over 12 to 15 cm., in nature only about 10 cm., but often forming dense masses 50 or more cm. in diameter; joints exceedingly variable, slightly to decidedly flattened or at times almost perfectly terete, narrowly obovate to cylindrical, $2\frac{1}{2}$ by 10 cm. or often 26 by 130 mm. or even as low as 12 by 30 mm., sometimes one on top of the other and 2 or 3 joints high, but usually new joints appear a little below on outside of outer joints of the clump, glaucous, bluish-green, young joints reddish tinged; leaves small, conical, cuspidate, greenish red, about 2 mm. long; areoles subcircular, 3 mm. in diameter, and 10 to 16 mm. apart, spicules light-brown, changing to a dirty brown, at first surrounded by a narrow gray zone of wool, which is later obliterated, the tuft, therefore, occupying the entire areole except the very narrow wool zone, commonly 2 mm. in length, and numerous; spines absent; flowers purple; fruit small, subglobose, 1 to $1\frac{1}{2}$ cm. in diameter, yellow or with a blush of red on one side.

The spicules are as described above in the type specimen, but they may range in color from dirty-yellow to deep brownish-red as is true of the entire group. The type is preserved under my collection No. 10,768, and occurs commonly in the mountain valleys above San Bernardino, California.

***Opuntia chaetocarpa* sp. nov.**

A tall, arborescent, open branched species, 2 to 3 m. high, and having a spread of branch about the same dimensions, with us now about 1 m. high and fruiting sparingly after, being set from cuttings June 1, 1912; joints obovate, glossy-dark-green, smooth to the touch, raised, tubercular at areoles the first season, but nearly smooth after that, measuring 14 by 27 cm. for early spring joints, which are fruiting now; areoles small, oval to ovate or obovate, becoming subcircular in age, at first 2 to 3 mm. long, later 2 to 3 mm. in diameter, brown; leaves circular in sections, subulate, cuspidate, mostly slightly recurved, 3 to 4 mm. long, spicules at first scarcely visible, but at 1 year of age form a compact tuft, 3 to 6 mm. long in upper part of areole, and increasing still further in age; spines white, at first single, erect, and about 2 cm. long, at 1 year of age, 2 or 3 divergent or erect, and 1 often 5 cm. long and others shorter, flattened, twisted; flowers greenish with tinge of red in bud, light yellow when opened, filaments greenish, style white with a scarcely noticeable tinge of red, stigma white, 6-parted; ovary obovate with deep conical pit at apex, prominent tubercles and 1 to 2 spines in each upper areole; fruit red, pyriform, edible, but of small size.

The description was drawn in July, 1913, from specimens grown under cultivation, the descriptions made in the field having been lost. The type bears my collection No. 9747, and was collected in the region of Oaxaca, Mexico, in August, 1909.

***Opuntia sanguinocula* sp. nov.**

A low, hemispherical, or usually more flattened shrub, 25 to 40 cm. high, and spreading 1 meter or more, main arms resting on ground on edge or ascending and secondary ones erect from them; joints broadly to narrowly obovate and sometimes nearly subcircular, some of last year's 9 by 25 cm., others 8 by 10 cm., mature growth of this year 6 by 8 to 8 by 12 cm., slightly glaucous, gray-green, slightly raised at areoles for a couple of years; areoles obovate, brown, 2 mm. long, enlarging to subcircular, and 3 to 4 mm. in diameter in age; leaves comparatively large, 12 mm. in length, subulate, cuspidate; spicules brown, turning dirty yellow, in a compact tuft in center of areole, completely surrounded by a zone of wool, 2 mm. long, in age filling the areole entirely and becoming 3 to 4 mm. in length; spines white, 1 to 3, mostly 1 or 2, confined to upper and marginal areoles of the joint, erect, diverging or in age, the second especially sloping down, 15 to 25 mm. long, slightly flattened, twisted, with bone-like tips; flowers lemon yellow with bright deep red glossy centers, filaments yellow distally and greenish, proximally, stigma white, 6-parted, 6 to 7 cm. in diameter when fully opened; fruit light pinkish red, and at this place often persisting to second year and bleaching again to greenish yellow, always greenish within.

The type is preserved under my inventory No. 9359, and was grown from plants secured near Taylor, Texas, in July, 1908. The description was drawn from cultivated plants at Chico, California, July, 1913.

***Opuntia riparia* sp. nov.**

An erect, hemispherical, open branched shrub, 150 to 175 cm. high, and having a spread of 2 or more m.; joints long, obovate, sharply to broadly rounded above, glaucous, about 15 by 23 cm.; areoles large, obovate on sides but subcircular on edges of joints and often 8 mm. in diameter, brown, not raised; spicules 1 cm. long, in a spreading unequal tuft on edges and shorter on sides of joints, light brown; spines white, often but not always colored at very base, 2 to 3 cm. long, very stout, flattened, twisted, 2 to 3 on sides and 3 to 6 on edges of joints, the upper central erect, the others spreading or sloping downward; flowers yellow, deeper yellow within, filaments orange, style white, stigma very large, deep green, 10 to 11 parted, 10 cm. in diameter when fully opened; fruit red with purplish tinge.

Frequent along upper foothills' courses of dry washes in the Santa Rita Mountains, Arizona. Collected April, 1908, and grown in cultivation since that date.

Opuntia rugosa sp. nov.

A low, ascending, radiating, yellow-green species, 60 cm. or more high, with main branches resting on edge and radiating, and others erect from them, often having a spread of 150 cm. or more; joints obovate, broadly rounded above, about 11 by 14 cm., or again 14 by 23 cm., sharply rounded above, tubercular raised at areoles the first season, later becoming nearly smooth, but a little raised at 2 and 3 years; areoles obovate, tawny-brown the first year, 5 by 3½ mm., later becoming sub-circular, and 5 mm. in diameter, dirty gray, varying 2 to 4 cm. apart; leaves large, subulate, cuspidate, dull-light-reddish tipped, 1 cm. long; spicules conspicuous, formidable, in a compact, unequal, triangular, or crescentic area above, with a few scattering through remainder of areole, yellow; spines white, only occasionally slightly tinted at base, erect, diverging in all directions, at first 2 or 3 increasing to 4 or 6, 2 or 3 of which are central, long, large, flattened, twisted, sometimes becoming 6 cm. long, others 2 to 3 cm. long, and somewhat recurved; flowers opening at noon, canary yellow, 7 to 8 cm. in diameter when fully opened, yellowish-green with a tinge of dull red in bud, petals obovate, cuneate, broadly rounded above, the outer row obtuse, wavy, or almost crenate, slightly eroded, slightly greenish within, filaments yellow, greenish at base, style white, stigma deep dark-green, 8-parted; ovary clavate, 3 by 6 cm., tubercular, raised at the light-brown areoles, which are nearly filled with yellow spicules, and long fugaceous spines, 1 cm. in length; fruit pyriform, reddish purple.

The type is preserved under my inventory No. 10,364, and was secured originally near Pomona, California.

Opuntia affinis sp. nov.

A low, arborescent species, from 125 cm. high with us at 4 years of age to 2 m. or more in its natural habitat; joints obovate, 13 by 35 cm., broadly rounded above and gradually narrowed below, densely silky, villous to the touch, and villous nature plainly visible when viewed in proper light, slightly raised at areoles, the tubercles being surrounded by a sunken dark-green line; leaves small, subulate, pointed, scarcely 2 mm. in length; areole small, obovate, 3 mm. long, 25 to 30 mm. apart, white to gray; spicules light straw-colored, at first not conspicuous but rather in a connivent tuft, 3 mm. long; spines absent below and 1 to 5 in upper ⅔ of joint, straw-colored, becoming white the second year, the longest 3 cm. and others much shorter, increasing in age in both length and numbers, at 3 years often 10 in number and some 6 cm. long, divergent, flattened, angular, twisted; flowers dull dark-red in bud, with stigma protruding the day before the petals spread, small, about 3 cm. in diameter when opened, petals 20 to 25 mm. long, slightly, when at all, recurved, ribs of petals red and wings orange, filaments greenish below and pink above, style bright-glossy red, stigma dull-greenish-red, 4-parted, equaling the petals in length; ovary small, subglobose, deeply pitted, 15 to 17 mm. in diameter, with small subcircular to slightly

transversely elongated, dirty, brown areoles, 4 mm. apart; fruit small, subglobose, red.

In some respects the species stands midway between the genera *Nopalea* and *Opuntia*. Occasionally the pistil is actually longer than the petals. The type is preserved under my inventory No. 9751, and was collected in the State of Oaxaca, Mexico.

***Opuntia confusa* sp. nov.**

“Still later, while the page proof of this paper was in hand, Dr. Griffiths’s publication of *O. arizonica* was received, which proved to be an anticipation of another of my species. I accordingly here substitute Dr. Griffiths’s name, allowing, however, my description to stand as already in type.”—Contr. U. S. Nat. Herb., 12: 402. 1909.

The facts appear to be as follows:

(1) *Opuntia arizonica* Griffiths is from the highlands of northern Arizona, and has never been collected in the southern part of the State.

(2) The plant referred to by Doctor Rose grows near Tucsón, and so far as known, does not occur on the San Francisco Highland.

(3) There is little in common between the two species except the mere arrangement of the spines.

(4) It is an error to refer this Tumamoc Hill species to *Opuntia arizonica*.

(5) To this Tumamoc Hill species, I apply the above name, the type of which is my inventory No. 10,441, and refer to the description associated with the above reference. Several emendations, however, are necessary. The flowers are only 5 to 8 cm. in diameter. The spicules are not “caducous except on margins of joints.” It is true that they are all easily separable, but more so on the edges than on the sides of the joints. The fact is that the spicules on the edges and sides of joints are radically different. In the latter situation, they are short and more closely aggregated, while in the former they measure a centimeter in length, are more scattered through the areole, and more easily separable. This is a characteristic of a very large group of southwestern species, if indeed it may not be said to be common enough in the flat-jointed species to be considered a group characteristic. The fruit is short-pyriform to subglobose, red, with abundant bloom which is largely lost at complete maturity, when the color becomes dark dull red. The color of the spines can not be called “bright red,” but dark-red to reddish-brown.